REMARKS

Applicant wishes to thank Examiner Bibbins and her Primary Examiner Wayne Young for the courtesy of an interview on October 23, 2007. Claim 1 and the (U.S. 5,587,986) and *Kasai et al.* (U.S. 4,866,687) reference were discussed. The Examiner indicated that the claim amendments presented would overcome the prior art. Applicant has amended the Claims accordingly. Claims 1-12 remain in the Application.

The Office Action rejected Claim 9 under 35 U.S.C. § 101 because the invention is directed to non-statutory subject matter. Applicant has amended the claim language according to the Examiner's suggestions.

The present invention results from the discovery that by comparing a wobble signal amplitude corresponding to the zero cross point of a tracking error (TE) signal to a predetermined value, the polarity and detection of the moving direction of an optical disc can be accurately determined. Optical discs and apparatuses used to read them have existed for many years. Thus, there are many competitors available in the field and consumers have a wide variety of choices in determining which product to purchase and use. Therefore, consumers demand the latest features and increasingly demand optical discs with the latest features. Thus, optical discs are a crowded field and any improvement, no matter how minor can be the crucial difference between commercial success or failure.

> "Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light."

Continental Can Co. USA Inc. v. Monsanto Co., 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

The present invention is directed towards allowing a tracking lead-in to be performed stably and accurately during an activation or a seek even at high speeds in areas where no information has been recorded and there is no reflectance ratio difference between grooves and lands. (Pg. 1, lns. 5 – 17). As seen in Figure 5, a disc motor 102 rotates the optical disc 101 and outputs a rotational position signal to detect the optical spot on the optical disc 101 as rotation angle information. The optical head 103 comprises an optical detector and the optical head 103 outputs a differential signal from the optical detector as a push-pull signal ("PP signal"). A tracking error signal (TE signal) is obtained as a low-pass filter ("LPF") 104 removes the wobble signal component from the PP signal. The PP signal is passed through a band-pass filter ("BPF") 105 of a wobble signal band to obtain the wobble signal, and then passing the wobble signal through a detector 106 to obtain an amplitude component of the wobble signal. The amplitude component is passed through a LPF 107 to remove the partial amplitude variation due to modulation of the address information and obtain a WBA signal that indicates the wobble signal amplitude. (Pg. 22, lns. 8 – 25).

A speed detection unit 108 detects a relative moving speed between an optical spot and a track on the optical disc 101 by measuring the cycle of zero-cross point of the TE signal. To detect the zero-cross point, a hysterisis component is used to the remove the noise component. A polarity judgment unit 109 checks the WBA signal in correspondence with a section around the zero-cross point of the TE signal in terms of time, and if it detects that the WBA signal is equal to or lower than predetermined value, it judges that the corresponding section is a land. If there is a phase difference between the TE signal and the WBA signal due to the characteristics of each filter, the polarity judgment unit 109 makes an adjustment so that a time delay is not caused. The polarity judgment unit 109 further notifies a direction detection unit 110 whether a

differential coefficient of the TE signal, in terms of the section that was judged to be a land by the polarity judgment is positive or negative. As seen in Figure 6, the TE signal has a zero-cross at each center of the land and groove. As the optical spot moves from the inner circumference towards the outer circumference, the differential coefficient is positive if it is moving from the center of a land. Conversely, as the optical spot moves from the outer circumference toward the inner circumference, the differential coefficient is negative if it is moving from the center of a land. (Pg. 25, ln. 12 – Pg. 26, ln. 15).

When the moving speed detected by the speed detection unit 108 is within a predetermined range, the direction detection unit 110 detects and determines a moving direction from the differential coefficient of the TE signal.

Thus, the present invention allows faster and more stable activation of the optical disc apparatus and the seek than the prior art by allowing for a more accurate detection of the moving direction of the optical spot.

The Office Action rejected Claims 1-9 as being unpatentable over *Funamoto* (U.S. 5,587,986) in view of *Kasai et al.* (U.S. 4,866,687).

Funamoto is directed to an on-track detecting apparatus which can accurately detect an on-track state of a disk even in a high speed search in an optical disk apparatus for recording or reproducing data to/from an optical disk having byte patterns of a sample servo. (Abstract). It accomplishes this setting the mean value of amplitude values in two kids of wobble pit signals obtained from at least two wobble pits existing in the same servo bye and setting it to a reference signal. F*unamoto* then compares the reference signal with a clock pit signal obtained from the clock pit to a reference signal. If the clock pit value is larger than the mean value of the two wobble pits, it is determined that the system is on track. (Col. 4, lns. 16 – 39).

Funamoto does not disclose "a polarity judgment unit judging, by a polarity judgment, that the optical spot is on a land if a wobble signal amplitude value is equal to or lower than a predetermined value in vicinity of a zero-cross point." *Funamoto* discloses detecting an inversion (zero-cross) of the polarity of the tracking error signal and generating a detection signal to a circuit. When the inversion is detected, the detecting circuit 26 generates a timing signal to a latch circuit 10 (or 11). When the next inversion occurs, the detecting circuit 26 generates the timing signal to the latch circuit 11 (or 10) An adding circuit 23 then adds the outputs the latch circuits 10 and 11 and generates the mean value. The mean value is latched by a latch circuit 12 at a predetermined timing. A comparing circuit 16 compares the output of the latch circuit 6 to the latch circuit 12. If the former output is equal to or larger than the latter one, it is determined that the information detection point is located on a track. Thus, *Funamoto* counts the number of inversions corresponding with the timing of the inversions to determine whether the information detection point is located on a track or not. (Col. 3, lns. 39 – 64). *Funamoto* does not disclose using wobble signal and more specifically, the amplitude of the wobble signal near the zero-cross point to determine if the optical spot is on a land or not. *Funamoto* only uses the number of times an inversion (zero-cross) of the polarity is detected corresponding with the timing of the inversions to determine if the detection point is on a track or not.

In contrast, the present invention uses both a TE signal and amplitude of a wobble signal to determine if the optical spot is on a land. The optical head 103 outputs a differential signal from the optical detector as PP signal. The PP signal is then sent to the LPF 104 and a BPF 105 separately. In the LPF 104 the PP signal is filtered to remove the wobble signal component from the PP signal and produce the TE signal. That is, the wobble signal is stripped from the PP signal to produce the TE signal. In the BPF 105 a wobble signal band is used to obtain the

wobble signal from the PP. The wobble signal is then passed through a detector 106 to obtain an amplitude component of the wobble signal. The amplitude component is passed through a LPF 107 to remove the partial amplitude variation due to modulation of the address information and obtain a WBA signal that indicates the wobble signal amplitude. (Pg. 22, lns. 8 – 25). A polarity judgment unit 109 checks the WBA signal in correspondence with a section around the zero-cross point of the TE signal in terms of time, and if it detects that the WBA signal is equal to or lower than predetermined value, it judges that the corresponding section is a land. (Pg. 23, lns. 5 – 10). Thus, the present invention uses not only the TE signal, but also the amplitude of the wobble signal in determining whether an optical spot is on a land or not.

The Office Action admits that *Funamoto* does not teach or suggest "a moving direction judgment unit, when the relative moving speed is within a predetermined range and the polarity judgment unit has judged that the optical spot is on a land, judging a moving direction of the optical spot relative to the tracks, from a rise/decay direction of the tracking error signal."

However, *Kasai* also fails to recite "a moving direction judgment unit, when the relative moving speed is within a predetermined range and the polarity judgment unit has judged that the optical spot is on a land, judging a moving direction of the optical spot relative to the tracks, from a rise/decay direction of the tracking error signal."

Kasai is directed towards an access method for searching for an intended target track among numerous track formed on an optical disk in which a light spot is positioned to an intended target track using a course actuator and a fine actuator. (Col. 1, lns. 10 – 16).

The Office Action cites to Column 7, lines 17-39 of *Kasai* for the feature of the movint direction judgment unit. However, *Kasai* only teaches using the tracking signal 52 to produce down-pulse signal 53 and up-pulse signal 54 by using a comparator to produce a "1" if the

tracking signal is above a zero level and a "0" if the tracking signal is below a zero level. (Col. 7, lns. 17-39). *Kasai* does not use the rise/decay direction of the tracking signal, but rather uses a zero level. Thus, there is no indication that this is based on the rise/decay direction of the tracking error signal.

In contrast in the present invention, the moving direction judgment unit determines the direction of the optical spot using the rise/decay direction of the tracking error signal. As the optical spot moves from the inner circumference towards the outer circumference, the differential coefficient is positive if it is moving from the center of a land. Conversely, as the optical spot moves from the outer circumference toward the inner circumference, the differential coefficient is negative if it is moving from the center of a land. (Pg. 25, ln. 12 – Pg. 26, ln. 15). Based on the differential coefficient of the TE signal, the moving direction judgment unit can determine the direction of the optical spot.

Furthermore, neither *Funamoto* nor *Kasai* disclose "a signal detection unit including an optical head to transmit a push-pull signal from an optical spot focused on the optical disc, a low pass filter connected to the optical head, the low-pass filter receiving the push-pull signal, removing a wobble signal from the push-pull signal, and outputting a tracking error signal, and a band-pass filter of a wobble signal band connected to the optical head, the band-pass filter receiving the push-pull signal and allowing the wobble signal from the push-pull signal to pass through." There is no indication that either references uses the push-pull signal to obtain the wobble signal and the tracking error signal. There is no indication that either references uses a low pass filter to remove the wobble signal from the push-pass signal and obtain a tracking error signal, or a band pass filter to obtain a wobble signal from the push-pass signal.

With respect to Claim 6, *Funamoto* does not teach or suggest "an amplitude calculation

sub-unit calculating a wobble signal amplitude of a land that is adjacent to a given point on a track of the optical disc, using a reference radius position of a wobble phase, a track pitch, a wobble length, a track number, and a rotation angle." *Funamoto* discloses using the mean value of amplitude values in two kinds of wobble pits signals from at least two wobble pits existing in the same servo byte to achieve on-track detection. *Funamoto*, however does not disclose how to calculate the actual amplitude of the wobble signals used, and more specifically to calculate the actual amplitude of the wobble signal using a wobble phase, a track pitch, a wobble length, a track number, and a rotation angle. *Funamoto* also does not disclose that the wobble signal amplitudes are calculated for wobble signals on lands.

In contrast, in the present invention the wobble signal amplitude calculating unit 201 can calculate the wobble signal amplitude at a predetermined position of a land using:

$$Lt = \omega * Tp + \pi(2R + Tp),$$

$$d = 2\pi(Lt/Lw), \text{ and}$$

$$\sin(\omega) + \sin(\omega + d) = 2\sin(\omega + d/2)\cos(d/2)$$

by substituting values for R, Tp, Lw, Tn, and θ. (Fig. 11). The values for R, Tp, and Lw, can be acquired by reading the format data and the control data or by a measurement, are input beforehand. The remaining parameters, the track number Tn and the rotation angle θ, are input at the end of the seek. (Pg. 44, lns. 7 – 24).

For Claim 7, *Funamoto* fails to teach or suggest "a first judgment sub-unit judging that the optical spot is on a groove if a RF signal amplitude value from the optical disc is equal to or higher than a predetermined value." *Funamoto* only teaches using the differential between to RF signals between two wobble pits. In the present invention, however, first judgment sub-unit can determine if the optical spot is on a groove if a RF signal amplitude is higher than a predetermined value. As shown in Figure 6, the four white boxes indicate that the RF signal

amplitude exceeds a threshold value when the optical spot passes the grooves corresponding to the four tracks on which data is recorded. Once, the location of the groove is known, it is possible to determine the moving direction correctly from the differential coefficient of the TE signal. (Pg. 29, lns. 1 - 22).

All arguments for patentability with respect to Claim 1 are repeated and incorporated herein for Claims 8-9.

Claims 2-7 depend from and further define Claim 1, and are thus allowable, too.

For the above reasons, it is believed that the present application is now in condition for allowance and an early notification of the same is requested. If the Examiner believes a telephone interview will assist in the prosecution of this matter, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

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